The Level of English Language Teachers of The Pedagogical Aspects of Integrating Machine Translation In Teaching and Learning Within The TPACK Framework

(A Field Study on Secondary Schools in Yefren)

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ABSTRACT

This study aims to identify the level of English language teachers' knowledge regarding the pedagogical aspects of utilizing machine translation (MT) in teaching and learning, specifically through a field study conducted in secondary schools in Yefren. The researcher employed a descriptive analytical approach using social survey sampling [sociological surveying], which aligns with the nature and objectives of the study. A questionnaire was utilized as the primary research instrument, with a study sample consisting of 30 male and female teachers.

The findings of the study revealed that the level of English language teachers' knowledge regarding the pedagogical aspects of using machine translation was high (M = 3.84, 76.73%) in light of the TPACK (Technological Pedagogical Content Knowledge)

framework. It was also found that teachers possess good conceptual knowledge of machine translation, particularly as an application of Artificial Intelligence (AI), and can distinguish it from human translation.

Furthermore, the results indicated that the pedagogical roles of machine translation achieved the highest means, reflecting a strong awareness of its importance as a supportive tool for learning, while emphasizing its use as a supplement rather than a substitute. The results also demonstrated a good level of awareness regarding its educational applications, alongside a clear understanding of the risks associated with over-reliance and the necessity of employing it according to specific educational goals.

Considering these findings, the study recommends the development of training programs based on the TPACK framework and the integration of machine translation into English language teaching strategies. Additionally, the study suggests establishing organized educational policies for its use, enhancing the presence of AI-related topics in teacher preparation programs, and encouraging applied studies that explore the impact of this technology on the development of linguistic skills.

Keywords: (Machine Translation, English Language Teachers, Technology Integration in Education, Secondary Education, TPACK Model).

. الملخص:

تهدف هذه الدراسة إلى التعرف على مستوى معرفة معلمي اللغة الإنجليزية بالجوانب التربوية لاستخدام الترجمة الآلية في التعليم والتعلم (دراسة ميدانية على المدارس الثانوية/ يفرن)، استخدمت الباحثة المنهج الوصفي باستخدام عينات المسح الاجتماعي، الذي يتناسب مع طبيعة الدراسة وأهدافها، وقد استخدمت الاستبانة أداة للدراسة، وتتكون عينة الدراسة من

(30) معلم ومعلمة، وبينت نتائج الدراسة أظهرت نتائج الدراسة أن مستوى معرفة معلمي اللغة الإنجليزية بالجوانب التربوية لاستخدام الترجمة الآلية جاء مرتفعًا (م = 3.84، 76.73%) في ضوء إطار TPACK. كما تبين أن المعلمين يمتلكون معرفة مفاهيمية جيدة بالترجمة الآلية، خاصة باعتبارها أحد تطبيقات الذكاء الاصطناعي والتمييز بينها وبين الترجمة البشرية.

وأشارت النتائج إلى أن الأدوار التربوية للترجمة الآلية حققت أعلى متوسط، مما يعكس إدراكًا قويًا لأهميتها كأداة داعمة للتعلم، مع التأكيد على استخدامها كمساند لا بديل. كما أظهرت النتائج مستوى جيدًا من الوعي بتطبيقاتها التعليمية، إلى جانب إدراك واضح لمخاطر الاعتماد المفرط عليها وضرورة توظيفها وفق الأهداف التعليمية.

وفي ضوء هذه النتائج، أوصت الدراسة بضرورة تطوير برامج تدريبية قائمة على إطار TPACK، وإدماج الترجمة الآلية ضمن استراتيجيات تدريس اللغة الإنجليزية، إلى جانب وضع سياسات تربوية منظمة لاستخدامها، وتعزيز حضور موضوعات الذكاء الاصطناعي في برامج إعداد المعلمين، فضلًا عن تشجيع الدراسات التطبيقية التي تستكشف أثر هذه التقنية على تنمية المهارات اللغوية

INTRODUCTION

In recent decades, the educational process has witnessed rapid development driven by technological progress, particularly in the field of Artificial Intelligence (AI). These advancements have produced new educational tools that have contributed to changing patterns of teaching and learning. Machine Translation (MT) is one of the most prominent of these technologies, becoming widely available through digital applications such as Google Translate and DeepL. This has made it a powerful presence in foreign language education, especially the English language (Septiadi, 2019).

Despite this spread, the employment of machine translation in English language education still raises a clear pedagogical debate. On one hand, numerous studies point to its role in

supporting scaffolding, enhancing linguistic awareness, and facilitating reading comprehension for learners, especially those with limited linguistic proficiency. On the other hand, other studies warn against its excessive use due to the potential for over-reliance, a decline in language production, and a weakening of the development of communicative competence among learners (Al-Otaibi & Salama, 2023). This prevalence has raised fundamental pedagogical questions regarding the extent of teachers' readiness to employ machine translation in a conscious manner that serves language learning goals without leading to over-reliance or weakening learners' linguistic thinking skills.

In this context, modern literature emphasizes that the effectiveness of technology integration in education is not linked to its existence per se, but rather to the extent of the teacher's integrated pedagogical and technical knowledge that enables them to integrate it into classroom practices in a purposeful manner, as explained by the Technological Pedagogical Content Knowledge (TPACK) framework (Rizq, 2019).

The TPACK framework emphasizes that the effective use of any educational technology does not depend on technical knowledge alone, but on the teacher's ability to achieve a conscious integration between technology, academic content, and teaching strategies (Hassan, 2020). From this standpoint, understanding how English language teachers perceive the pedagogical integration of machine translation, and the extent of their possession of the knowledge necessary to achieve this integration, is pivotal for evaluating the quality of educational practices associated with using this technology in secondary education.

The Study Problem

Despite the widespread use of machine translation in English language education, many studies indicate a gap between the actual use of these tools and teachers' awareness of the pedagogical aspects regulating this use. This type of technology is often used spontaneously or without guidance, without sufficient awareness of its limitations or its positive and negative educational effects (Faraon, 2019).

In the Libyan context, the researcher notes a lack of studies addressing the level of English language teachers' knowledge of machine translation from a pedagogical perspective, especially at the secondary stage, where the teacher is expected to be able to guide students toward the optimal use of modern technologies.

Accordingly, the study problem is defined by the following main question:

What is the level of English language teachers' knowledge regarding the pedagogical aspects of using machine translation in teaching and learning?

The following sub-questions branch from this main question:

1. What is the level of English language teachers' knowledge regarding the concept of machine translation, its characteristics, and its limitations?
2. What is the level of teachers' knowledge regarding the pedagogical roles of machine translation in English language teaching?
3. What is the level of teachers' awareness regarding machine translation applications and their educational uses?
4. What is the level of teachers' knowledge regarding the pedagogical aspects regulating the use of machine translation in teaching and learning?

Significance of the Study

Theoretical Significance

This study contributes to enriching the pedagogical literature related to the employment of AI technologies in foreign language education by providing a scientific conception of the level of English language teachers' knowledge of machine translation in light of the TPACK framework, helping to clarify the relationship between technical knowledge, pedagogical knowledge, and educational content.

Applied Significance

The applied significance of the study lies in:

- Providing educational decision-makers with scientific data on the reality of machine translation use in secondary education.
- Contributing to the development of professional training programs for English language teachers.
- Assisting school administrations in establishing pedagogical regulations for the use of machine translation.
- Enabling teachers to employ machine translation consciously in a way that supports language learning.

Objectives of the Study

The study aims to:

1. Identify the level of English language teachers' knowledge regarding the concept of machine translation.
2. Reveal the level of teachers' awareness regarding common machine translation applications.
3. Determine the level of teachers' knowledge regarding the pedagogical aspects of using machine translation.
4. Highlight the knowledge gaps that may hinder the effective pedagogical employment of machine translation.

Scope of the Study

1. Subjective Scope: The study is limited to measuring the level of English language teachers' knowledge of machine translation in terms of its concept, applications, and pedagogical use, without addressing the measurement of its impact on student achievement.
2. Population Scope: The study is limited to English language teachers in a field study on secondary schools in Yefren.

3. Spatial Scope: The study is conducted in secondary schools belonging to the Yefren Municipality.
4. Temporal Scope: This study was conducted during the first semester of the academic year (2025/2026).

Study Terms

1. Machine Translation (MT): The process of converting texts from one language to other using computer systems based on AI technologies without direct human intervention.
    - Procedural Definition: In this study, it is defined as the digital applications used by teachers to translate texts to and from English for educational purposes (Al-Humaidan, 2001).
2. TPACK Framework: A model that illustrates the integration of the teacher's technological, pedagogical, and content knowledge.
3. Pedagogical Knowledge: The teacher's ability to employ appropriate educational methods to achieve learning goals (Koehler & Mishra, 2015).
4. Machine Translation in Teaching and Learning: The employment of machine translation as a supportive tool for teaching and learning English within a directed pedagogical context.
    - Procedural Definition: It refers to teachers' knowledge of how to use machine translation inside the classroom in a way that serves learning objectives (Souane Bouchra, 2024).

Previous Studies

A recent study by Ardiyanti & Frid (2025) focused on students' perceptions of using Google Translate in learning English within the context of a vocational secondary school in East Jawa, Indonesia. Using a mixed-methods approach, data was collected via questionnaires and

semi-structured interviews with 36 students. The study found that students frequently use Google Translate for words, sentences, and paragraphs in academic assignments, indicating a high level of reliance, particularly among students with low English proficiency. While it facilitates access to English, its limitations in translating contextual terms may hinder in-depth understanding. Thus, it is important for teachers to supervise students and integrate alternative educational resources to support independent linguistic skills.

The study by Alkhaldi (2024) explored English as Foreign Language (EFL) students' attitudes toward using machine translation in writing tasks at Misurata University, analyzing the positions of 32 students. Results showed that the majority of students use MT positively for spelling, vocabulary, and content construction, despite facing issues like inaccuracy in complex cases. The study concluded that MT effectiveness depends on appropriate pedagogical guidance from teachers. However, this study relied only on student perspectives without measuring teachers' pedagogical knowledge, which the current research addresses.

The Study of Mohamed Al-Behairi & Riyadh Al-Hassan, 2023 titled "English Language Teachers' Perceptions of Machine Translation (MT) and its Processes in Teaching and Learning." Using a descriptive analytical approach, data was collected and analyzed through a validated questionnaire consisting of three axes: general information, machine translation applications, and the teaching and learning process. Data was gathered from a stratified random sample of (56) English language teachers in Riyadh city. The research found that most participants were familiar with the concept and uses of MT, with 51.8% using it for lesson preparation. It also appeared that only small percentages (35.7%) were introduced to this concept during their undergraduate studies. Furthermore, the study highlighted teachers' confidence in using Google Translate compared to other applications. The results revealed a weak role of English language supervisors in raising teachers' awareness regarding MT use, alongside a high percentage of learners using it to complete writing assignments.

The Study of Seçkin CAN, 2023 aimed to explore teachers' perceptions of students' use of Google Translate in language learning across three universities in Turkey. The study employed a mixed-methods approach. The study tool was an electronic questionnaire divided into three sections: demographic information, teachers' opinions on students' habits in using Google Translate, and items investigating how teachers observe students' use of MT in English classes regarding patterns and ethics of use. The sample consisted of (46) teachers, and semi-structured interviews were conducted with (11) of them. The results were as follows: almost all students and teachers use Google Translate regularly; many students use it in reading and writing lessons; and students use Google Translate for more than just a dictionary function. This excessive use significantly reduces teachers' perception of its effectiveness and the ethics of its use. Despite teachers' concerns about long-term negative effects on student learning, they do not support banning it in language classes due to its simplicity and ease of use. Therefore, it is essential to establish effective policies to mitigate the harmful effects of modern technologies and ensure they are used effectively.

The Study published in (Söylem – Çeviribilim Özel Sayısı) by Seçkin Can, were the researcher explored English language teachers' perceptions regarding students' use of the Google Translate application in the context of language learning. Using a mixed-methods approach (questionnaire + interviews) with 46 teachers and 11 interviews, the study aimed to determine teachers' attitudes toward the application's effectiveness and the frequency of student use. The results showed a widespread use of Google Translate among students, with concerns among teachers regarding its educational effectiveness and potential impact on language skills if misused. Teachers also pointed out the absence of clear pedagogical policies to regulate the tool's use inside classrooms, though they did not support a total ban. Despite the descriptive value of this study, it focuses on a specific tool without measuring the broader conceptual and pedagogical knowledge of machine translation or linking the results to a pedagogical framework like TPACK, which is what the current study seeks to achieve.

Commentary on Previous Studies

Previous studies show an increasing interest in machine translation in English education from various angles, including teacher perceptions or student behaviours; however, this interest is characterized by methodological fragmentation.

The study by Mohamed Al-Behairi and Riyadh Al-Hassan (2023) addressed English language teachers' perceptions of machine translation (MT) and its processes in teaching and learning, using a descriptive approach and a multi-axis questionnaire. The results showed that most respondents had a general knowledge of MT concepts and uses, and a significant percentage employed it in lesson preparation, with high confidence in Google Translate compared to other apps.

However, the study revealed a weakness in the supervisory and guiding role in developing teachers' awareness of organized pedagogical MT use, as well as teachers' limited exposure to this concept during their university studies. Despite the importance of these results, the study focused primarily on the general description of perceptions and practices without linking them to a pedagogical framework that explains the nature of this knowledge or defines its levels.

In the international context, Seçkin Can (2023) conducted a study aimed at exploring teachers' perceptions of students' use of Google Translate in language learning at three Turkish universities, using a mixed-methods approach. The findings confirmed the widespread use of Google Translate by both students and teachers, with students moving beyond using it as a dictionary to include complex linguistic tasks, especially in reading and writing. The study also showed ethical and pedagogical concerns among teachers regarding the excessive use of the tool and its potential negative impact on student learning, while simultaneously rejecting the idea of a total ban and calling for effective regulatory policies.

Despite the depth of the qualitative results provided by this study, it was limited to a single tool (Google Translate) and focused on teachers' perceptions of student use, without

measuring the teachers' own level of conceptual or pedagogical knowledge regarding machine translation as a broader educational technology.

The study published in Söylem – Çeviribilim Özel Sayısı aligns with Seçkin Can's (2023) findings, confirming the common use of Google Translate and the absence of clear pedagogical frameworks to regulate it. However, like previous studies, it did not adopt a structured pedagogical theoretical framework to analyze teachers' knowledge or explain their practices.

Based on the above, it is clear that previous studies contributed to:

- Describing the reality of machine translation use.
- Highlighting teachers' perceptions and concerns.
- Revealing the absence of organized pedagogical policies.

However, they did not systematically address the level of English language teachers' knowledge regarding the conceptual, pedagogical, and applied aspects of machine translation. Furthermore, they did not link this knowledge to a comprehensive theoretical framework such as the Technological Pedagogical Content Knowledge (TPACK) model, which allows for explaining the relationship between technical, pedagogical, and specialized knowledge.

Accordingly, the current study aims to fill this research gap by measuring the level of English language teachers' knowledge of machine translation in light of the TPACK framework. It seeks to uncover the dimensions and limits of this knowledge, contributing to a deeper and more organized understanding of the conscious pedagogical use of machine translation in teaching and learning, particularly in the secondary education context.

Theoretical Framework

Machine Translation (MT)

Machine translation has undergone significant development in recent decades, particularly with the transition from rule-based models to statistical models, and subsequently to Neural Machine Translation (NMT) models, which rely on Artificial Intelligence and deep learning techniques. This evolution has contributed to improving the accuracy and fluency of translation, leading to the widespread use of MT in various fields, including education.

In the context of foreign language teaching, MT is no longer viewed merely as a tool for literal translation, but as a supportive medium that can be employed to develop vocabulary, understand texts, and increase linguistic awareness—provided it is used within a guided pedagogical framework. However, these potentials remain contingent upon the extent of teachers' understanding of the nature and limitations of this technology. (Laqmash, 2024)

Types of Machine Translation and Educational Limitations

Machine translation is divided into several types, most notably rule-based, statistical, and neural translation. Neural translation is the most common in modern applications due to its ability to process linguistic context with a higher degree of accuracy compared to previous types. Despite this progress, MT is not without limitations, such as:

- Poor handling of idiomatic expressions.
- Limited understanding of cultural context.
- The possibility of producing grammatically or semantically inaccurate translations.

Recognizing these limits is a fundamental element of teachers' knowledge of MT; ignoring them leads to non-pedagogical use that may negatively affect language learning. (Aya, 2026)

Machine Translation and English Language Teaching (ELT)

Educational literature has addressed the role of machine translation (MT) in English language teaching from two contrasting perspectives. The traditional trend suggests that reliance on translation may hinder the development of linguistic competence. In contrast, the modern trend emphasizes that MT can be a supportive tool if used consciously and purposefully (Tsai, 2019).

Recent studies have indicated that the use of machine translation helps learners to:

- Improve text comprehension.
- Develop vocabulary.
- Increase learning autonomy.

However, these benefits are closely linked to the teacher's role in guiding students to use machine translation in a balanced, pedagogical manner (Lee, Sangmin, 2019).

Technological Pedagogical Content Knowledge (TPACK) Model

The TPACK model is one of the most prominent theoretical frameworks explaining the integration of technology in education. It illustrates that the effective use of educational technologies requires a balanced interaction between:

- Content Knowledge.
- Pedagogical Knowledge.
- Technological Knowledge.

In light of this model, English language teachers' knowledge of MT is not limited to knowing the technical tool itself but includes perceiving how to employ it to serve the objectives of English language teaching. (Mishra & Koehler ,2006)

Research Methodology

Methodological Procedures

The study followed the descriptive methodology using a comprehensive social survey.

Study Sample

The study sample consists of all English language teachers in secondary schools in Yefren for the academic year (2025/2026), totaling (30) teachers.

First: Validity of the Study Tool (Questionnaire)

Validity and Reliability of the Questionnaire:

Validity:

Validity refers to ensuring that the questionnaire measures what it was designed to measure. To verify the validity of the questionnaire used in this study and to ensure the accuracy, consistency, clarity, and suitability of its items for the research environment, the researcher conducted the following validity tests:

Face Validity (Expert Validity):

To ensure the questionnaire's validity, the researcher presented it to a group of experienced specialists and experts in Libyan universities. They were asked to provide their opinions and suggestions regarding the questionnaire and to judge the items' suitability for application in the study. The experts were specifically asked to evaluate the following:

- The credibility, validity, and phrasing of the items.
- The extent to which each item belongs to its assigned variable or scale.
- Adding, modifying, or deleting items as they deemed appropriate.

Based on the valuable feedback received from the experts, several adjustments were made to reach the final version of the questionnaire.

Second: Criterion-Related Validity

Validity means that the questionnaire questions measure what they were set to measure. To confirm the validity and measure the reliability of the study tool, 10 pilot copies were distributed. Data was analyzed using the Statistical Package for the Social Sciences (SPSS) through the "Extreme Groups Comparison" method:

Extreme Groups Comparison Validity (Discriminatory Validity):

The scale scores of the pilot study were ranked in descending order, and the top 27% (Upper Group) and the bottom 27% (Lower Group) were selected. Subsequently, the differences between the two groups were calculated using T-tests. An Independent Samples T-test was employed to determine if there is a statistically significant difference between the mean scores of the lower and upper groups. This was achieved by aggregating the total scores of the items for each axis to establish an extreme groups comparison.

Specifically, the T-test value was calculated to examine the significance of the differences between the mean of the lower quartile (the lowest 27% of values) and the mean of the upper quartile (the highest 27% of values) across all study scales, as follows:

Table (1): T-Test Results for Peripheral Comparison

Axis	27% Bottom		27% Top		Calculated T-Value	Sig. (p-value)
	(Mean/SD)	Standard Deviation	(Mean/SD)	Standard Deviation		
Conceptual Knowledge of MT	2.73	0.1155	4.73	0.3055	17.321	0.003
Pedagogical Roles of MT	2.13	0.4163	4.47	0.1155	13.229	0.006
Apps & Learning Uses	2.20	0.2000	4.87	0.1155	40.000	0.001
Pedagogical Regulations	2.07	0.4163	4.87	0.2309	24.249	0.002
Overall Axes	2.53	0.4646	4.57	0.3819	17.429	0.003

The table demonstrates that the calculated T-values for the comparison between the lower and upper quartiles of the scale axes—which are (17.321, 13.229, 40.000, 24.249, 17.429)—were greater than the critical T-value of (4.303). Furthermore, the corresponding p-values were all lower than (0.05), which is the significance level adopted for this study, reaching (0.003, 0.006, 0.001, 0.002, 0.003). Accordingly, it can be concluded that there are statistically significant differences between the lower and upper quartiles across all scale axes.

Cronbach's Alpha α :

This is considered one of the essential statistical tests for analyzing questionnaire data. It measures the reliability (internal consistency) of the instrument (Al-Bayati, 2005). The Cronbach's Alpha coefficient ranges between (0 and 1) and indicates the degree of correlation between the respondents' answers.

When the coefficient value is zero, it indicates an absolute lack of correlation between the responses. If the value is one (1.00), it indicates a perfect correlation between the responses. It is widely established that the minimum acceptable value for Cronbach's Alpha (α) is 0.6, while the optimal range is between (0.7 to 0.8). Values exceeding 0.8 are considered even more robust, as shown in Table (2):

Table (2): Cronbach's Alpha α Reliability Results

Axis	No. of Items	Cronbach's Alpha (Reliability)	Validity (Square Root of Alpha)
Conceptual Knowledge	**5**	**0.839**	**91.60%**
Pedagogical Roles	**5**	**0.848**	**92.09%**
Apps & Learning Uses	**5**	**0.887**	**94.18%**
Pedagogical Regulations	**5**	**0.923**	**96.07%**
Overall Axes	**20**	**0.939**	**96.90%**

Table (2) illustrates that the reliability coefficients (Cronbach's Alpha α) for all scale axes were high and statistically acceptable. The reliability coefficient for the "Conceptual Knowledge of Machine Translation" axis reached (0.839), a high value indicating a good level of reliability and internal consistency among the items. Similarly, the "Pedagogical Roles of Machine Translation" axis yielded a coefficient of (0.848), demonstrating a solid degree of internal consistency. The "Applications and Educational Uses" axis recorded a high coefficient of (0.887), reflecting appropriate internal consistency. Furthermore, the "Pedagogical Aspects Regulating MT Use" axis achieved a high coefficient of (0.923), indicating a superior level of reliability. The overall reliability coefficient for all combined axes reached (0.939), a high value confirming that the scale possesses a high degree of reliability and internal consistency across all its items.

Regarding the Validity Index—calculated as the square root of the Cronbach's Alpha α coefficient multiplied by 100—the results were as follows:

- Conceptual Knowledge axis: (91.60%), a high percentage indicating strong validity.
- Pedagogical Roles axis: (92.09%), a high and statistically acceptable percentage.
- Applications and Educational Uses axis: (94.18%), reflecting a good level of validity.
- Pedagogical Aspects Regulating MT Use axis: (96.07%), indicating an excellent degree of validity.
- Overall Validity for combined axes: (96.90%).

This high overall value confirms that the study tool possesses an exceptional degree of validity and reliability, proving its suitability for measuring the study variables and achieving its objectives with an appropriate level of accuracy and dependability.

Consequently, the validity and reliability of the study scale have been verified, providing full confidence in the instrument's integrity and its readiness for data analysis to address the study's hypotheses and research questions.

Personal Data Analysis

Gender Distribution:

Table (3): Frequency distribution of respondents by gender

Gender	Count	Percentage
Male	6	20.0%
Female	24	80.0%
Total	30	100%

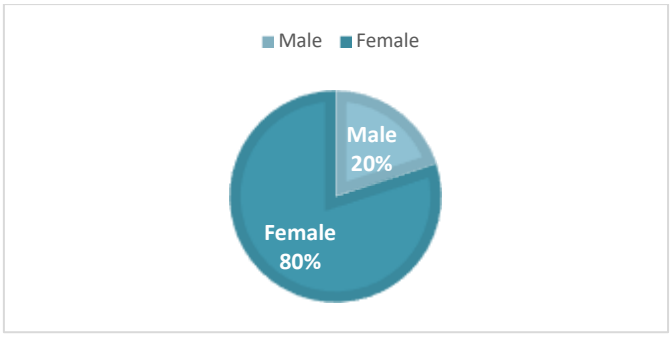

Figure (1) Distribution of the Study Population by Gender

It is evident from Table (3) and Figure (1) that the highest percentage of the study sample by gender was female (80.0%), while males represented 20.0% of the total sample.

Years of Teaching Experience:

Table (4) and Figure (2) display the distribution of the study sample according to their years of teaching experience.

Table (4): Frequency distribution according to years of teaching experience

Years of Experience	Count	Percentage
Less than 5 years	8	26.7%
5 to 10 years	16	53.3%
More than 10 years	6	20.0%
Total	30	100.0%

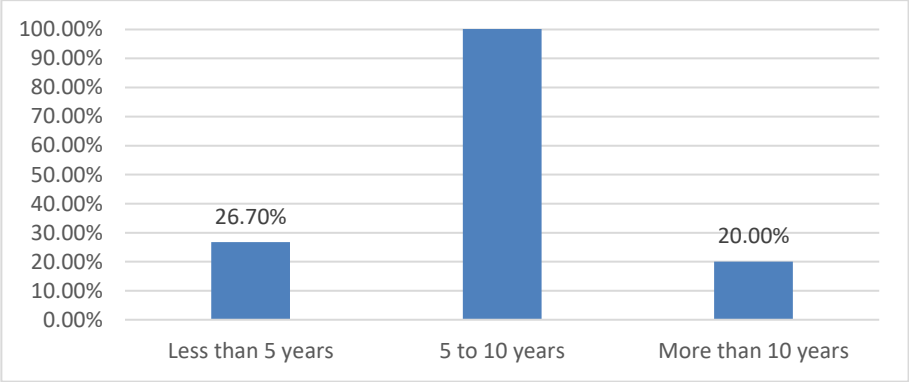

Figure (2): Percentages of the study population by years of teaching experience.

It is evident from Table (4) and Figure (2) that the highest percentage of the study sample according to years of experience was the category of 5 to 10 years, reaching 53.3%. This is followed by those with less than 5 years of experience at 26.7%, while the lowest percentage was for those with more than 10 years of experience, at 20%.

Educational Qualification:

It is evident from Table (5) and Figure (3) that the highest percentage of the study sample by academic qualification was Bachelor's degree (50.0%), followed by High Diploma (33.3%), while Postgraduate studies represented 16.7%.

Table (5): Frequency distribution according to educational qualification

Educational Qualification	Count	Percentage
Bachelor's (Licence)	15	50.0%
High Diploma	10	33.3%
Postgraduate Studies	5	16.7%
Total	30	100. %

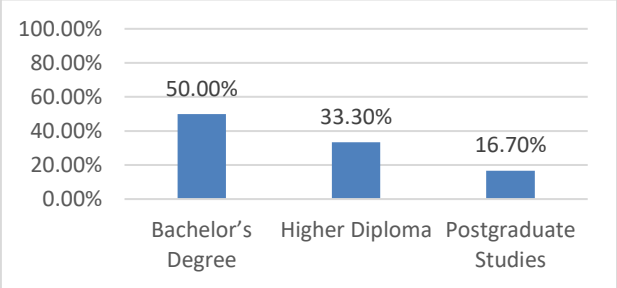

Figure (3): Percentages of the study population by educational qualification

It is evident from Table (5) and Figure (3) that the highest percentage of the study sample by academic degree was Bachelor's (Licentiate) at 83.3%, while the Postgraduate category represented the lowest percentage at 16.7%.

Answering the Study Questions:

Scale Scoring:

To achieve the study's objectives and analyze the collected data, the researcher employed a numerical coding method for the responses based on the five-point Likert scale, as shown in Table (6):

Table (6): Distribution of scores for scale responses

Response	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Score	1	2	3	4	5

Subsequently, the Arithmetic Mean (Weighted Mean) was calculated to determine the weight of each item based on the values obtained from the response analysis, as shown in Table (6). After coding and entering the data into the computer, the class interval for the five-point Likert scale (lower and upper limits) used in the study axes was determined. The range was calculated by subtracting the lowest score from the highest score (5 - 1 = 4), and then divided by the five levels of the scale (4 ÷ 5 = 0.80). This value represents the length of each category or level. Accordingly, the weighted mean intervals are distributed as shown in the following table:

Table (7): Weighted average levels for analysis

Level	Very Low	Low	Medium	High	Very High
Range	1 to less than 1.80	1.80 to less than 2.60	2.60 to less than 3.40	3.40 to less than 4.20	4.20 to 5.00

Question One: What is the level of English language teachers' knowledge regarding the concept, characteristics, and limitations of machine translation?

To answer this question in terms of the degree of agreement, the arithmetic mean, standard deviation, and relative weight for each item will be presented. Additionally, the importance and ranking of each item will be illustrated in descending order based on the mean scores in the following table:

Table (8): Mean and Relative Weight of the Study Sample's Responses

No.	Statement	Mean	SD	Relative Weight	Rank	Approval
1	Understands MT as an AI application	4.13	0.8604	82.67%	1	High
2	Distinguishes between MT and human translation	3.67	1.0933	73.33%	2	High
5	Aware of MT limits in education	3.57	1.5906	71.33%	3	High

3	Knowledge of MT mechanisms (Statistical/Neural)	3.50	1.1064	70.00%	4	High
4	Realizes results vary by linguistic context	3.50	1.5702	70.00%	4	High
Overall Average		3.67	0.8859	73.47%	—	High

Table (8) demonstrates that the degree of approval for the axis items as a whole was high, with an overall arithmetic mean of 3.67, a standard deviation of 0.8859, and a relative weight of 73.47%. The items were ranked in descending order according to the respondents' approval as follows:

1. Statement (1): "I understand the concept of machine translation as an application of artificial intelligence." This item ranked first with a high degree of approval, reaching an arithmetic mean of 4.13, a standard deviation of 0.8604, and a relative weight of 82.67%.
2. Statement (2): "I can distinguish between machine translation and human translation in terms of accuracy and educational function." This item ranked second with a high degree of approval, with an arithmetic mean of 3.67, a standard deviation of 1.0933, and a relative weight of 73.33%.
3. Statement (5): "I am aware that machine translation has limitations and cannot be relied upon in all educational situations." This item ranked third with a high degree of approval, recording an arithmetic mean of 3.57, a standard deviation of 1.5906, and a relative weight of 71.33%.
4. Statement (3) and (4): "I have general knowledge of how machine translation works (statistical or neural)" and "I realize that machine translation results vary according to linguistic context." Both items ranked fourth with a high degree of approval, each reaching an arithmetic mean of 3.50, with standard deviations of 1.1064 and 1.5702 respectively, and a relative weight of 70.00% for both.

Question Two: What is the level of teachers' knowledge regarding the pedagogical roles of machine translation in English language teaching?

To answer this question in terms of the degree of agreement, the arithmetic mean, standard deviation, and relative weight for each item will be presented. Additionally, the importance and ranking of each item will be illustrated in descending order based on the mean scores in the following table:

Table (9): Mean and Relative Weight of the Study Sample's Responses

No.	Statement	Mean	SD	Relative Weight	Rank	Approval
4	MT as a tool, not a substitute for learning	4.80	0.4068	96.00%	1	Very High
1	Supports learning new vocabulary	4.47	0.5074	89.33%	2	Very High
2	Helps understand difficult texts early on	4.33	0.4795	86.67%	3	Very High
5	Identifies appropriate classroom MT situations	3.90	0.5477	78.00%	4	High
3	Awareness of negative effects on thinking	3.77	0.5683	75.33%	5	High
Overall Average		4.25	0.2030	85.07%	—	Very High

Table (9) demonstrates that the degree of approval for the axis items as a whole was very high, with an overall arithmetic mean of 4.25, a standard deviation of 0.2030, and a relative weight of 85.07%. The items were ranked in descending order according to the respondents' approval as follows:

1. Statement (4): "I believe that machine translation should be used as a supporting tool, not as a substitute for language learning." This item ranked first with a very high degree of

approval, reaching an arithmetic mean of 4.80, a standard deviation of 0.4068, and a relative weight of 96.00%.

2. Statement (1): "I see that machine translation can be used to support the learning of new vocabulary." This item ranked second with a very high degree of approval, with an arithmetic mean of 4.47, a standard deviation of 0.5074, and a relative weight of 89.33%.

3. Statement (2): "I believe that machine translation helps students understand difficult texts in the early stages of learning." This item ranked third with a very high degree of approval, recording an arithmetic mean of 4.33, a standard deviation of 0.4795, and a relative weight of 86.67%.

4. Statement (5): "I can identify the appropriate educational situations for using machine translation inside the classroom." This item ranked fourth with a high degree of approval, reaching an arithmetic mean of 3.90, a standard deviation of 0.5477, and a relative weight of 78.00%.

5. Statement (3): "I realize that the unregulated use of machine translation may negatively affect students' linguistic thinking skills." This item ranked fifth with a high degree of approval, with an arithmetic mean of 3.77, a standard deviation of 0.5683, and a relative weight of 75.33%.

Question Three: What is the level of teachers' awareness regarding machine translation applications and their educational uses?

To analyze the items of this axis in terms of the degree of approval, the arithmetic mean, standard deviation, and relative weight for each item will be presented. Additionally, the importance and ranking of each item will be illustrated in descending order based on the mean scores in the following table:

Table (10): Mean and Relative Weight of the Study Sample's Responses

No.	Statement	Mean	SD	Relative Weight	Rank	Approval
2	Uses MT in preparing lessons/activities	4.17	0.8339	83.33%	1	High
1	Knowledge of common apps (Google Translate)	4.10	1.0619	82.00%	2	High
3	Guides students on correct educational use	3.87	1.0417	77.33%	3	High
5	Determines if MT fits student level	3.10	1.4227	62.00%	4	Medium
4	Distinguishes educational vs. non-educational use	3.07	1.4368	61.33%	5	Medium
Overall Average		3.66	0.7393	73.20%	—	High

Table (10) demonstrates that the degree of approval for the axis items as a whole was high, with an overall arithmetic mean of 3.66, a standard deviation of 0.7393, and a relative weight of 73.20%. The items were ranked in descending order according to the respondents' approval as follows:

6. Item (2): "I sometimes use machine translation in preparing lessons or educational activities." This item ranked first with a high degree of approval, reaching an arithmetic mean of 4.17, a standard deviation of 0.8339, and a relative weight of 83.33%.

7. Item (1): "I have knowledge of common machine translation applications such as Google Translate." This item ranked second with a high degree of approval, with an arithmetic mean of 4.10, a standard deviation of 1.0619, and a relative weight of 82.00%.

8. Item (3): "I guide my students on how to use machine translation in a correct educational manner." This item ranked third with a high degree of approval, recording an arithmetic mean of 3.87, a standard deviation of 1.0417, and a relative weight of 77.33%.

9. Item (5): "I can determine when the use of machine translation is appropriate for the students' level." This item ranked fourth with a moderate degree of approval, reaching an arithmetic mean of 3.10, a standard deviation of 1.4227, and a relative weight of 62.00%.

10. Item (4): "I can distinguish between the educational use and the non-pedagogical use of machine translation." This item ranked fifth with a moderate degree of approval, with an arithmetic mean of 3.07, a standard deviation of 1.4368, and a relative weight of 61.33%.

Question Four: What is the level of teachers' knowledge regarding the pedagogical aspects regulating the use of machine translation in teaching and learning?

To analyze the items of this axis in terms of the degree of approval, the arithmetic mean, standard deviation, and relative weight for each item will be presented. Additionally, the importance and ranking of each item will be illustrated in descending order based on the mean scores in the following table:

Table (11): Mean and Relative Weight of the Study Sample's Responses

No.	Statement	Mean	SD	Relative Weight	Rank	Approval
4	Notices excessive student reliance on MT	4.17	0.9499	83.33%	1	High
1	Links MT use to clear educational goals	3.97	1.0981	79.33%	2	High
5	Pedagogical knowledge to employ MT safely	3.83	1.1167	76.67%	3	High
3	Sets classroom rules for MT organization	3.63	1.2726	72.67%	4	High
2	Considers student linguistic level	3.20	1.2972	64.00%	5	Medium
Overall Average		3.76	0.7955	75.20%	—	High

Table (11) demonstrates that the degree of approval for the axis items as a whole was high, with an overall arithmetic mean of 3.76, a standard deviation of 0.7955, and a relative weight of 75.20%. The items were ranked in descending order according to the respondents' approval as follows:

1. Statement No. (4): "I can notice students' excessive reliance on machine translation" ranked first with a high degree of approval. It achieved an arithmetic mean of 4.17, a standard deviation of 0.9499, and a relative weight of 83.33%.
2. Statement No. (1): "I link the use of machine translation to clear educational goals" ranked second with a high degree of approval. It achieved an arithmetic mean of 3.97, a standard deviation of 1.0981, and a relative weight of 79.33%.
3. Statement No. (5): "I possess pedagogical knowledge that enables me to employ machine translation without harming English language learning" ranked third with a high degree of approval. It achieved an arithmetic mean of 3.83, a standard deviation of 1.1167, and a relative weight of 76.67%.
4. Statement No. (3): "I set classroom rules to regulate the use of machine translation during learning" ranked fourth with a high degree of approval. It achieved an arithmetic mean of 3.63, a standard deviation of 1.2726, and a relative weight of 72.67%.
5. Statement No. (2): "I consider the students' linguistic level when allowing the use of machine translation" ranked fifth with a medium degree of approval. It achieved an arithmetic mean of 3.20, a standard deviation of 1.2972, and a relative weight of 64.00%.

Results

1. High Knowledge Level: The results revealed a high level of English language teachers' knowledge regarding the pedagogical aspects of using machine translation (MT) in teaching and learning within the TPACK framework. The overall arithmetic mean reached 3.84 with a

standard deviation of 0.497 and a relative weight of 76.73%, indicating a high level of pedagogical awareness associated with employing this technology in educational practices.

2. Conceptual Knowledge: Teachers' conceptual knowledge of machine translation was high (M = 3.67, W = 73.47%). The highest response was for understanding MT as an artificial intelligence application, followed by the ability to distinguish between MT and human translation regarding accuracy and educational function.
3. Educational Roles: The results showed that the "Educational Roles of MT" axis received the highest approval levels among all axes ($M = 4.25, W = 85.07%). This reflects a high perception among teachers of its pedagogical value as a supporting tool for the learning process.
4. Key Indicators: The strongest indicators within this axis were the teachers' very high agreement on the necessity of using MT as a learning aid rather than a substitute (M = 4.80), in addition to their awareness of its role in supporting the learning of new vocabulary (M = 4.47).
5. Applications and Uses: The results revealed that the educational applications and uses of MT received a high approval rating (M = 3.66, W = 73.20%). Teachers indicated they sometimes use it in preparing lessons and educational activities and possess good knowledge of its most common applications.
6. Regulating Pedagogical Aspects: The results explained that the pedagogical aspects regulating the use of MT received a high approval rating (M = 3.76, W = 75.20%). Teachers' awareness of the problem of students' excessive reliance on MT emerged prominently, alongside their awareness of the importance of linking its use to educational goals.

Recommendations

1. Professional Development: Design professional development programs based on the TPACK framework targeting English language teachers. These should focus on developing

the integration of technological, pedagogical, and content knowledge to enhance effective educational use of MT in classroom practices.

2. Curriculum Integration: Integrate machine translation into English language teaching strategies within the curricula. This can be achieved by developing pedagogical guidebooks explaining how to employ MT to support vocabulary learning, reading comprehension, and writing, emphasizing its use as a supportive educational tool.

3. Policy Development: Develop organized educational policies for using MT in education that include clear regulations and guidelines for both teachers and students. This contributes to reducing excessive reliance and promotes a conscious, critical use of this technology in the context of language learning.

4. Teacher Preparation: Incorporate topics of linguistic AI and machine translation into teacher preparation programs in Faculties of Education. This enhances the conceptual and applied knowledge of pre-service teachers and qualifies them to effectively employ these technologies in designing educational activities.

5. Empirical Research: Encourage conducting empirical and applied studies that explore the impact of employing MT on developing various English language skills (reading, writing, vocabulary, translation). This contributes to building an empirical knowledge base that supports integrating this technology into education.

6. Digital Integration: Enhance the integration between modern digital technologies and language teaching by developing digital learning environments that support the pedagogical use of MT alongside other AI tools. This helps improve the quality of language learning and develops contemporary teaching practices.

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